

# **First ISCCP Regional Experiment (FIRE) Cirrus 2 NCAR Sabreliner Ice Water Concentrations Langley DAAC Data Set Document**



## **Summary:**

The First ISCCP Regional Experiments have been designed to improve data products and cloud/radiation parameterizations used in general circulation models (GCMs). Specifically, the goals of FIRE are (1) to improve basic understanding of the interaction of physical processes in determining life cycles of cirrus and marine stratocumulus systems and the radiative properties of these clouds during their life cycles and (2) to investigate the interrelationships between the ISCCP data, GCM parameterizations, and higher space and time resolution cloud data.

To-date, four intensive field-observation periods were planned and executed: a cirrus IFO (October 13-November 2, 1986); a marine stratocumulus IFO off the southwestern coast of California (June 29-July 20, 1987) a second cirrus IFO in southeastern Kansas (November 13-December 7, 1991); and a second marine stratocumulus IFO in the eastern North Atlantic Ocean (June 1-June 28, 1992). Each mission combined coordinated satellite, airborne, and surface observations with modeling studies to investigate the cloud properties and physical processes of the cloud system.

## **Table of Contents:**

1. [Data Set Overview](#)
2. [Investigator\(s\)](#)
3. [Theory of Measurements](#)
4. [Equipment](#)
5. [Data Acquisition Methods](#)
6. [Observations](#)
7. [Data Description](#)
8. [Data Organization](#)
9. [Data Manipulations](#)
10. [Errors](#)
11. [Notes](#)
12. [Application of the Data Set](#)
13. [Future Modifications and Plans](#)
14. [Software](#)
15. [Data Access](#)
16. [Output Products and Availability](#)
17. [References](#)
18. [Glossary of Terms](#)
19. [List of Acronyms](#)
20. [Document Information](#)

## **1. Data Set Overview:**

### **Data Set Identification:**

**FIRE\_CI2\_SABRLNR\_IWC:**

First ISCCP Regional Experiment (FIRE) Cirrus 2 NCAR Sabreliner  
IWC Data

### **Data Set Introduction:**



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### **Objective/Purpose:**

...

### **Summary of Parameters:**

Ambient Temperature  
Barometric Altitude  
Dew/Frost Point Temperature  
Diffusional Growth Rate  
Ice Water Content  
Particle Diameter  
Particle Number Concentration  
Precipitation Rate  
Radar Reflectivity  
Relative Humidity  
Static Pressure  
Vertical Velocity  
Water Vapor Density

### **Discussion:**

...

### **Related Data Sets:**

...

## **2. Investigator(s):**

### **Investigator(s) Name and Title:**

Dr. Andrew J. Heymsfield

### **Title of Investigation:**

First ISCCP Regional Experiment (FIRE).

### **Contact Information:**

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## **3. Theory of Measurements:**

...

## **4. Equipment:**

### **Sensor/Instrument Description:**

### **Collection Environment:**

...

### **Source/Platform:**

NCAR Sabreliner



**Source/Platform Mission Objectives:**

...

**Key Variables:**

Ambient Temperature  
Barometric Altitude  
Dew/Frost Point Temperature  
Diffusional Growth Rate  
Ice Water Content  
Particle Diameter  
Particle Number Concentration  
Precipitation Rate  
Radar Reflectivity  
Relative Humidity  
Static Pressure  
Vertical Velocity  
Water Vapor Density

**Principles of Operation:**

The microphysical parameters in the data set were derived from 2D probe data collected by the NCAR aircraft during FIRE II. The 2D-C data are converted to size spectra according to the guidelines given in Heymsfield and Baumgardner (1985, Bull. Amer. Meteor. Soc.), where one element is added to the size of a particle along the flight direction to account for the probe's intrinsic start-up time. Size is determined as the maximum dimension ( $D_{\max}$ ) along the flight direction or optical array axis. The nominal size resolution for the Sabreliner 2D probe is 50 microns/per shadowed optical array element, for the King Air is 25 microns/bin. Sample area (SA) is derived using the depth of field estimates reported by Knollenberg (1970). Particles are binned into 32 size categories, nonuniformly spaced with higher resolution in the smaller classes. Particles within each size bin are subdivided into 10 "area ratio (AR)" bins, where AR represents the ratio of particle area to the area of discs of diameter  $D_{\max}$ .

The microphysical parameters in the data set were derived from 2D probe data collected by the NCAR Sabreliner during FIRE II. The derivation of the microphysical parameters is outlined in the later reference to Heymsfield (1977). The vertical velocity is the "steady-state" velocity in cm s<sup>-1</sup> to keep the relative humidity at its currently measured value. Differential growth rate represents the growth rate of the particle population of different sizes at the current relative humidity. The Total differential growth rate is the sum of the growth rate in all channels. The assumptions used for the IWC calculations are reported in Heymsfield; also, generic size to mass equations are used. Precipitation rate is calculated from particle size and terminal velocity data, integrated over the size spectrum. Concentration data are as derived above. Number of crystal-crystal collisions are derived from the data reported by Hindman and the crystal terminal velocities. Water vapor density and supersaturation information in this data set should not be used - it is unreliable. Curve fits to the data using least squares methods are provided.

**Sensor/Instrument Measurement Geometry:**

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**Manufacturer of Sensor/Instrument:**

...

**Sensor/Instrument:**

PMS 2D-C PROBE  
PMS 2D-P PROBE

**Calibration:****Specifications:**

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**Tolerance:**

...

**Frequency of Calibration:**

...



Other Calibration Information:

...

5. Data Acquisition Methods:

...

6. Observations:

Data Notes:

...

Field Notes:

...

7. Data Description:

Spatial Characteristics:

Spatial Coverage:

Data Set Name	Min Lat	Max Lat	Min Lon	Max Lon
FIRE-CI2_SABR LNR_IWC	27.08	38.95	-99.25	-92.67

Spatial Coverage Map:

...

Spatial Resolution:

Not applicable.

Projection:

...

Grid Description:

...

Temporal Characteristics:

Temporal Coverage:

Data Set Name	Begin Date	End Date
FIRE- CI2_SABRLNR_IWC	11-17-1991	12-07-1991

Temporal Coverage Map:

...

Temporal Resolution:



Daily

## Data Characteristics:

### Parameter/Variable:

...

### Variable Description/Definition:

...

### Unit of Measurement:

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### Data Source:

...

### Data Range:

...

## Sample Data Record:

...

## 8. Data Organization:

### Data Granularity:

A general description of data granularity as it applies to the IMS appears in the [EOSDIS Glossary](#).

The data is organized on a single flight basis, for both the Kingair and the Sabreliner. Relevant portions of the header from the raw binary files are included. Each data file contains processed concentration data based on habit type and area ratio.

### Data Format:

Native

## 9. Data Manipulations:

### Formulae:

### Derivation Techniques and Algorithms:

...

### Data Processing Sequence:

#### Processing Steps:

...

#### Processing Changes:

...

### Calculations:

### Special Corrections/Adjustments:

...

### Calculated Variables:



...

**Graphs and Plots:**

...

**10. Errors:**

**Sources of Error:**

...

**Quality Assessment:**

**Data Validation by Source:**

...

**Confidence Level/Accuracy Judgement:**

...

**Measurement Error for Parameters:**

...

**Additional Quality Assessments:**

...

**Data Verification by Data Center:**

The Langley DAAC performs an inspection process on this data received by the data producer via ftp. The DAAC checks to see if the transfer of the data completed and were delivered in their entirety. An inspection software was developed by the DAAC to see if the code was able to read every granule. The code also checks to see if every parameter of data falls within the ranges which are included in the granule. This same code extracts the metadata required for ingesting the data into the IMS. If any discrepancies are found, the data producer is contacted. The discrepancies are corrected before the data are archived at the DAAC.

**11. Notes:**

**Limitations of the Data:**

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**Known Problems with the Data:**

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**Usage Guidance:**

...

**Any Other Relevant Information about the Study:**

...

**12. Application of the Data Set:**

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**13. Future Modifications and Plans:**

...

**14. Software:**



## Software Description:

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## Software Access:

The software can be obtained through the Langley DAAC. Please refer to the contact information below. The software can also be obtained at the same time the user is ordering these data sets.

## 15. Data Access:

### Contact Information:

Langley DAAC User and Data Services Office  
NASA Langley Research Center  
Mail Stop 157D  
Hampton, Virginia 23681-2199  
USA  
Telephone: (757) 864-8656  
FAX: (757) 864-8807  
E-mail: [support-asdc@earthdata.nasa.gov](mailto:support-asdc@earthdata.nasa.gov)  
URL: <http://eosweb.larc.nasa.gov>

### Data Center Identification:

Langley DAAC User and Data Services Office  
NASA Langley Research Center  
Mail Stop 157D  
Hampton, Virginia 23681-2199  
USA  
Telephone: (757) 864-8656  
FAX: (757) 864-8807  
E-mail: [support-asdc@earthdata.nasa.gov](mailto:support-asdc@earthdata.nasa.gov)  
URL: <http://eosweb.larc.nasa.gov>

### Procedures for Obtaining Data:

The Langley DAAC Information Management System (IMS) is an on-line system that features a graphical user interface (GUI) which allows users to query the Langley DAAC data set holdings, to view pre-generated browse products, and to order specific data products. Users may also request data by letter, telephone, electronic mail (INTERNET), or personal visit.

The Langley DAAC User and Data Services (UDS) staff provides technical and operational support for users ordering data. The Langley DAAC Handbook is available in a postscript file through the IMS for users who want detailed information about the Langley DAAC holdings. Users may also obtain a copy by contacting:

Langley DAAC User and Data Services Office  
NASA Langley Research Center  
Mail Stop 157D  
Hampton, Virginia 23681-2199  
USA  
Telephone: (757) 864-8656  
FAX: (757) 864-8807  
E-mail: [support-asdc@earthdata.nasa.gov](mailto:support-asdc@earthdata.nasa.gov)  
URL: <http://eosweb.larc.nasa.gov>

### Data Center Status/Plans:

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## 16. Output Products and Availability:

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## 17. References:

Heymsfield, A. J., 1977: Precipitation development in stratiform ice clouds: A microphysical and dynamical study. J. Atmos. Sci., 34, 284--295.



Heymsfield, A. J. and J. L. Parrish, 1978: A computational technique for increasing the effective sampling volume of the PMS 2-D particle size spectrometer. J. Appl. Meteor., 17, 1566--1572.

Parrish, J. L., and A. J. Heymsfield, 1985: A user guide to a particle growth and trajectory model (Using one-dimensional and three-dimensional wind fields). NCAR Tech Note NCAR/TN-259+1A, 69 pp.

Sorlie, S., February 1993. "Langley DAAC Handbook." NASA/Langley Research Center, Hampton, Virginia.

## 18. Glossary of Terms:

[EOSDIS Glossary.](#)

## 19. List of Acronyms:

**NASA** - National Aeronautics Space Administration

**URL** - Uniform Resource Locator

[EOSDIS Acronyms.](#)

## 20. Document Information:

### Document Revision Date:

August 18, 1997; November 24, 1997

### Document Review Date:

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### Document ID:

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### Citation:

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### Document Curator:

Langley DAAC User and Data Services Office

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